HARDWOOD CONTROL BY INJECTION WITH TWO NEW CHEMICALS[1/]. J. L. Michael, USDA Forest Service, Southern Forest Experiment Station, Auburn, AL 36849.

ABSTRACT

AC 252,925 [Arsenal®], and 3,6-dichloropicolinic acid (XRM-3972) were tested at two different strengths against seven hardwood species. Triclopyr [Garlon 3A®] was used as a standard, making a total of five herbicide treatments. All treatments were applied in June 1983. Fifteen months after treatment, only AC 252,925 gave acceptable kill over the entire range of species tested. Triclopyr gave good control of sourwood [Oxydendron arboreum (L.) DC.], blackgum (Nyssa sylvatica Marshall), and red maple (Acer rubrum L.). Full strength XRM-3972 killed only 17 percent of treated stems.

INTRODUCTION

Tree injection is one of the most labor intensive, effective, and environmentally safe methods of chemically controlling hardwoods in southern pine forests. The method is widely used throughout the National Forests and by private landowners with small acreages. Several chemicals have been tested (1,2) and shown to have acceptable activity on some species. Most chemicals available for injection, however, do not give good control of dogwood or red maple except when incisions are made edge-to-edge. New chemicals are needed that can control all species equally well and that can be injected at very wide spacings. Use of very wide spacings in operational injection treatments saves labor and reduces treatment costs.

This paper presents results of tests of two new chemicals, AC 252,925 and XRM-3972, and compares them with triclopyr. Injections were at very wide spacings on dogwood, red maple, blackgum, sourwood, chestnut oak (Quercus prinus L.), scarlet oak (Quercus coccinea Muenchh.), and white oak (Quercus alba L.).

[1/] Discussion of herbicides in this paper does not constitute recommendation of their use or imply that uses discussed here are registered. If herbicides are handled, applied, or disposed of improperly, there is potential for hazards to the applicators, off-site plants, and environment. Herbicides should be used only when needed and should be handled safely. Follow the directions and heed all precautions on the container label.

Use of trade names is for the reader's information and convenience. Use in this study does not constitute official endorsement or approval by the U. S. Department of Agriculture to the exclusion of any other suitable product.

METHODS

The study was installed in June 1983 on a well drained, silt loam soil on the Cohutta Ranger District of the Chattahoochee National Forest near Chatsworth, Georgia. The test site had been clear-cut and contained a residual stand of mixed hardwood and pine.

The five herbicide treatments tested were AC 252,925 [Arsenal®], AC 252,925 diluted to 1 pound per gallon with water, XRM-3972, XRM-3972 diluted to 1.5 pounds per gallon with water, and triclopyr [Garlon 3A®] diluted to 1.5 pounds per gallon with water. AC 252,925 was formulated as 2 pounds of active ingredient per gallon while XRM-3972 and triclopyr were formulated as 3 pounds acid equivalent per gallon.

Each treatment was applied to five randomly located stems of each of seven hardwood species. All stems were sufficiently well separated to preclude any interference among treatments. Diameter at breast height (d.b.h.) was recorded for each stem, and treatment was based on this data. Stem diameters for treatments and species were analyzed by ANOVA at the $p = 0.05$ level to determine whether there was any interaction between stem size and treatment.

One incision was made for each 3 inches d.b.h., which is equivalent at the base of the tree to approximately 9 inches edge-to-edge for the 3-inch injector used in this study. The minimum treatment was one incision. Two milliliters of herbicide solution were introduced into each incision via a hypodermic syringe.

Treatment effects were assessed in September 1984. Each tree was judged dead (percent kill equals 100 percent) if there was complete defoliation with no signs of resprouting. All other trees were judged alive (percent kill equals 0 percent). Percent kill data were submitted to a stepwise logistic regression to determine significance of treatment effects.

RESULTS AND CONCLUSIONS

Stems used in this study ranged from 1.8 to 10.3 inches d.b.h. ANOVA at the 0.05 probability level showed no differences in stem diameter among treatments but there were differences among species (Table 1). In general, the smallest stems in the study were dogwood, blackgum, and sourwood; the largest were the oaks and red maple. There were no stem diameter-treatment interactions in this study.

AC 252,925 was very active on all seven species tested with only two tree species showing less than 100 percent kill at the lower concentration (Table 2). Over all species treated, however, there were no significant differences between full strength and diluted AC 252,925 treatments. Additional tests should be designed to determine: 1) the maximum degree of dilution that will, when injected, give acceptable hardwood kill, 2) whether there is a seasonal response to AC 252,925, and 3) the range of species against which AC 252,925 is active.

The triclopyr treatment resulted in poor hardwood control in this test, except against blackgum (100 percent kill) and red maple and sourwood (80 percent kill). The poor performance in this test may be related to differences in species susceptibility and seasonal variations in response. Differences in species susceptibility to triclopyr have been reported (1). Campbell reported good control from a May treatment with triclopyr, but poor control against blackjack oak (Quercus marilandica Muenchh.) from December (2) and July (1) treatments. The application rate (one injection per 2.8 to 3.5 inches d.b.h.) was similar to the rate used in this study. Thus a seasonal response, which has not been completely defined, exists for triclopyr. Early spring injection may be the only effective injection treatment with triclopyr.

XRM-3972, a relative of picloram, is a unique compound that is most active on leguminous plants. It was included in this study to determine whether direct injection into the plant would significantly increase its activity on species that it does not normally affect. Injection at full strength did not result in significant activity, only killing 17 percent of all stems treated. Dogwood and red maple were unaffected. Diluted XRM-3972 killed only 3 percent of treated stems.

Comparing the activity of diluted AC 252,925 with that of triclopyr in this test indicates AC 252,925 is approximately 2.4 times as biologically active as triclopyr; 1 pound gave 1.7 times as high a kill as 1.5 pounds of triclopyr. Additional testing with AC 252,925 should be conducted with solutions containing 0.25, 0.50, and 0.75 pounds of AC 252,925 per gallon so that cost effectiveness of this compound can be computed when retail prices have been established.

LITERATURE CITED

1. Campbell, Thomas E. 1980. A comparison of five tree-injected herbicides. Proc. South. Weed Sci. Soc. 33:127-131.

2. Campbell, T. E. 1983. Three new herbicides tested for tree injection. Proc. South. Weed Sci. Soc. 36:260-264.

3. Snedecor, George W., and William G. Cochoran. 1969. Statistical Methods. Ed. 6, 593 pp. Ames, Iowa: Iowa State University Press.

Table 1. Mean diameter of hardwood stems by species and treatment for the 1983 hardwood injection study, Chatsworth, Georgia.

Species	Treatment*					Average**
	1	2	3	4	5	
	-d.b.h. (inches)-					
Scarlet Oak	7.7	7.2	6.0	7.6	6.9	7.1 a
Chestnut Oak	4.6	5.8	5.8	7.0	5.2	5.7 b
Red Maple	5.3	5.7	4.9	5.5	5.8	5.5 b
White Oak	5.5	4.6	6.3	5.3	4.5	5.2 bc
Sourwood	4.8	4.7	3.5	3.7	4.2	4.2 cd
Blackgum	5.0	6.0	2.2	4.2	3.1	4.1 d
Dogwood	3.2	4.2	4.1	3.4	4.0	3.8 d
Average	5.2	5.5	4.7	5.2	4.8	5.1

* 1=Two pounds AC 252,925 per gallon, 2=One pound AC 252,925 per gallon, 3=One and one-half pounds triclopyr per gallon, 4=Three pounds XRM-3972 per gallon, 5=One and one-half pounds XRM-3972 per gallon.
** Means followed by the same letter are not different by ANOVA and Duncan's multiple range test at the p = 0.05 level.

Table 2. Percent kill of hardwood stems by species and treatment for the 1983 hardwood injection study, Chatsworth, Georgia.

Species	Treatment*					Average
	1	2	3	4	5	
	-percent kill-					
Scarlet Oak	100	100	50	20	0	54
Chestnut Oak	100	100	40	20	0	52
Red Maple	100	80	80	0	0	52
White Oak	100	100	20	20	0	48
Sourwood	100	100	100	40	20	72
Blackgum	100	100	100	20	0	64
Dogwood	100	80	0	0	0	36
Average**	100 a	94 a	56 b	17 c	3 c	

* 1=Two pounds AC 252,925 per gallon, 2=One pound AC 252,925 per gallon, 3=One and one-half pounds triclopyr per gallon, 4=Three pounds XRM-3972 per gallon, 5=One and one-half pounds XRM-3972 per gallon.
** Means in this row followed by the same letter are not different by stepwise logistic regression at the p = 0.05 level.